providing a first component having a first longitudinal bore and a first tapered engagement portion with a linear cross-sectional profile that is symmetrical about a first longitudinal axis;

providing a second component having a second longitudinal bore and a second tapered engagement portion with a curved cross-sectional profile that is symmetrical about a second longitudinal axis;

abutting the first component against the second component with their longitudinal axes aligned and their tapered engagement portions in contact with each other, such that the contacting surface between the components is circular; and

urging the first and second components against each other.

REMARKS

In an Office Action mailed October 23, 2002, the Examiner rejects all pending claims. In particular, the Examiner raises the following issues:

(A) the specification is objected to for failing to provide proper antecedent basis for claims 1-16;

(B) claims 13 and 17-24 stand rejected under 35 U.S.C. § 112 for containing subject matter not sufficiently described in the specification, and claims 1-24 stand rejected under 35 U.S.C. § 112 for being indefinite;

(C) claim 25 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Hashimoto ('084); and

(D) claims 1-24 stand rejected under 35 U.S.C. § 103(a) as being obvious in light of Hashimoto ('084).

A. Proper Antecedent Basis for Claims 1-16

The Examiner has objected to the specification for failing to provide proper antecedent basis for the claims, as filed.

Applicants have amended the term "coupling" in the claims to read "component," a term that was used in the original specification at page 4, line 1; applicants have also copied the terms "tapered female mouth" and "tapered male mouth" from the Summary of the Invention to

the Detailed Description section of the specification; and applicants have copied the term "fitting" from the claims to the Detailed Description section of the specification, and has noted that a fitting is a widely recognized component in a piping system.

Accordingly, applicants assert that, as amended above, the specification is no longer objectionable, and respectfully requests that this objection be withdrawn.

B. Claim Rejections Under 35 U.S.C. § 112

The Examiner has rejected all claims under Section 112.

The amendments herein obviate or render moot the Examiner's Section 112 rejections. In particular, claims 13, 16 and 18-20 have been canceled from the present application. Claim 17 has been amended to reflect that both the male and female couplings are "tapered." One taper is linear and the other taper is curved. As discussed above, this language is supported by the specification. The applicants have made the changes recommended and/or proposed by the Examiner for resolving the Section 112, second paragraph rejections.

Accordingly, applicants respectfully request that the rejections under Section 112 be withdrawn.

C. Section 102(b) Rejection of Claim 25 – Hashimoto ('084)

The Examiner rejects claim 25 under 35 U.S.C. § 102(b) on the grounds that Hashimoto ('084) discloses every element of this claim. Claim 25, as amended, distinguishes applicants' invention from Hashimoto because Hashimoto does not disclose a method for forming a fluid-tight seal that comprises providing engagement surfaces that contact at an angle measuring between 40 and 68 degrees with respect to the radial axes of the engagement regions.

Therefore, Hashimoto does not anticipate applicants' invention under 35 U.S.C. Section 102(b). As discussed below, the invention recited in claim 25 is also not obvious in light of Hashimoto.

D. Section 103(a) Rejections of Claims 1-25 in View of Hashimoto ('084)

1. Claims 1-25

The Examiner rejects claims 1-25 under 35 U.S.C. § 103(a) on the grounds that the claimed ranges of the contact angles recited therein are obvious as being only optimal or workable ranges discovered through routine skill from the Hashimoto disclosure ('084).

An analysis under Section 103 requires that the Examiner explain why, after assessing the level of those skilled in the art, the skilled artisan would have found the claimed subject matter, as a whole, to have been obvious. To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine references, and there must be a reasonable expectation of success. MPEP § 706.02(j). The suggestion or motivation to make the claimed invention and the reasonable expectation of success must both be found in the prior art. *Id.* The Examiner cannot rely on hindsight as the basis for combining two references. If the references do not expressly or impliedly suggest the invention, "the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Id.* (citing *Ex parte Clapp,* 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In the present case, the Examiner rejects the applicants' claims with the sole explanation being "it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ said range in Hashimoto, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill" (October 23, 2002 Office Action, p. 6). Applicants respectfully disagree.

There is no motivation in the Hashimoto reference or elsewhere in the record indicating that changing the contact angle between the linear profile and the rounded profile will affect performance. Consequently, there is no teaching or suggestion to one of ordinary skill in the art that the contact angle should be optimized or changed at all. Without a suggestion to optimize the contact angle, those of ordinary skill in the art have continued to bore holes in pipes

without being concerned of the contact angle, which is all that Hashimoto suggests. Accordingly, in the decade since Hashimoto issued, there has been no known advancements that improve on the configuration of Hashimoto by modifying the contact angle. Discovering that the contact angle is a variable affecting performance is a significant aspect of applicants' invention. It is impermissible hindsight to assume away the inventiveness in applicants' solution, when nothing in the prior art identifies the existence of a problem.

The Examiner accordingly has not succeeded in bringing a *prima facie* case of obviousness in this instance. Claims 1-12, 14, 15, 17 and 21-25 are therefore patentable under Section 103(a) over Hashimoto. Claims 13, 16 and 18-20 have been cancelled.

2. New Claim 26

New claim 26 is also patentable over Hashimoto. Claim 26 is directed toward a linear configuration in which the vessel and fittings are aligned along a common axis, to minimize relative movement between the parts, among other benefits. Hashimoto is directed to a branching connector orthogonally connected to a fuel rail.

Hashimoto solves a completely different problem by teaching to mechanically fasten the branching connector to avoid embrittled welds caused by engine vibrations. Hashimoto *anticipates relative motion* between the branch connector which is orthogonolly connected to the fuel rail; therefore, Hashimoto requires that the receiving port be double tapered with the outer taper having a more gentle gradient (Figure 1b).

Conversely, applicants' invention is to *minimize relative motion* between the components to prevent fretting, spalling and galling; thus preventing cracks in the check valve 14 and extending the life span of the components. Applicants have also identified that the contact angles may be adjusted within discreet ranges depending on the materials used for the mating components in order to improve sealing without using an intermediate seal and without imparting undue stresses on the mating components (Figures 3-4). Hashimoto makes no such disclosure or suggestion.

Accordingly, new claim 26 is also patentable under Sections 102 and 103 over Hashimoto.

Conclusion

The specification and all pending claims are in condition for allowance, and applicants respectfully request the same. Applicants invite the Examiner to contact the undersigned by telephone to discuss any of the issues raised herein, or any other remaining issues.

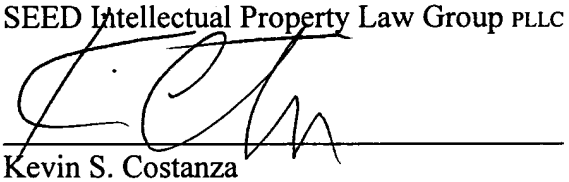
The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version With Markings to Show Changes Made.**"

Respectfully submitted,

Jordan J. Hopkins et al.

SEED Intellectual Property Law Group PLLC



Kevin S. Costanza
Registration No. 37,801

KSC/RCV:ljs

Enclosure:
Postcard

701 Fifth Avenue, Suite 6300
Seattle, Washington 98104-7092
Phone: (206) 622-4900
Fax: (206) 682-6031

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

The paragraph beginning at page 4, line 1, has been amended as follows:

Figure 2 illustrates an assembly 100 of components and/or fittings, such as valves and plugs, from an ultrahigh pressure fluid containment system. The illustrated components are a check valve 102, a vessel 104, and a plug 106. Each of the components in the assembly 100 can be manufactured from like materials, such as stainless steel. As described in more detail below, the present invention allows the components to be compressed together to form a fluid seal between adjacent components without the requirement of a gasket. Further, the geometry of the components minimizes relative movement between the components as the pressure within the assembly 100 cycles.

The paragraph beginning at page 4, line 14, has been amended as follows:

In the illustrated embodiment, the engagement portion 108 of the check valve 102, the mouths 110/114 on the vessel 104, and the engagement portion 112 on the plug 106 are all radially symmetric with respect to a radial axis "r" extending along the length of the assembly 100. During operation, the components of the assembly 100 are compressed in the axial direction "r" to form the subject seals. One of the adjacent components has a tapered female mouth and the other component has a complementary tapered male mouth, each of the mouths having a mating portion for contacting the other component. One of the mating portions has a substantially linear cross-sectional profile, while the other has a convex, curved cross-sectional profile.

A paragraph, beginning at page 5, between lines 20 and 21, has been added as follows:

The inventors also appreciate that either or both of the fittings in the illustrated embodiment can have an engagement portion with a linear cross-sectional profile and the vessel have a mouth with a convex, curved cross-sectional profile.

In the Claims:

Claims 13, 16 and 18-20 have been cancelled.

Claim 26 has been added.

Claims 1-12, 14, 15, 17, 21, 24 and 25 have been amended as follows (all claims are provided for convenience):

1. (Amended) A ~~coupling for~~ pair of adjacent components from a containment system for fluids at pressures in excess of 15,000 psi, providing ~~for~~ a seal between the adjacent ~~bodies~~ components of like material without the need for an insert therebetween, the adjacent ~~bodies~~ components being aligned along a coupling axis, the ~~coupling~~ pair of adjacent components comprising:

a tapered female mouth integrally formed on one of the adjacent ~~bodies~~ components, the tapered female mouth having a female mating portion; and

a tapered male mouth integrally formed on the other of the adjacent ~~bodies~~ components, the tapered male mouth having a male mating portion sized to contact the ~~tapered~~ female mating portion; wherein

one of the male and female mating portions has a substantially linear cross-sectional profile, the linear cross-sectional profile being angled between 40 and 68 degrees from the coupling axis; and

the other of the male and female mating portions has a convex, curved cross-sectional profile, the curved cross-sectional profile ~~forming~~ contacting the linear cross-sectional profile in a substantially circular seal ~~when urged into contact with the linear cross-sectional profile~~.

2. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the linear cross-sectional profile is on the tapered female mouth and the curved cross-sectional profile is on the tapered male mouth.

3. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the linear cross-sectional profile is angled between 50 and 59 degrees from the coupling axis.

4. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the linear cross-sectional profile is angled approximately 54 degrees from the coupling axis.

5. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the curved cross-sectional profile is substantially arcuately shaped.

6. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the curved cross-sectional profile is substantially elliptically shaped.

7. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the tapered female mouth is radially symmetric about the coupling axis.

8. (Amended) The ~~coupling~~ pair of adjacent components of claim 1 wherein the tapered male mouth is radially symmetric about the coupling axis.

9. (Amended) A fitting ~~formed of a metallic material~~ for sealing a fluid at a pressure greater than or equal to 15,000 psi ~~in~~ between the fitting and a vessel ~~of a like metallic material~~, without requiring an insert therebetween, the vessel having a vessel bore extending along a longitudinal axis, the vessel bore terminating in a tapered mouth for engaging the fitting, the tapered mouth being radially symmetric about the longitudinal axis and comprising a metallic material for contacting the fitting~~along a coupling axis~~, the fitting comprising:

a fitting bore extending along a radial axis and terminating in a tapered engagement portion, the tapered engagement portion being radially symmetric about the radial

axis, the tapered engagement portion being sized and shaped to sealingly contact the tapered mouth when the longitudinal axis is aligned with the radial axis and the fitting is urged against the vessel, a contact region between the vessel and the fitting ~~in~~ forming a circular seal that is radially symmetric about both the longitudinal axis and the radial axis, the circular seal having a tangential contact angle measuring between 40 and 68 degrees from the longitudinal and radial axes~~coupling axis~~.

10. (Amended) The fitting of claim 9 wherein the tapered engagement portion has a convex, curved cross-sectional profile for engagement with ~~a~~ the tapered mouth having a linear cross-sectional profile.

11. (Amended) The fitting of claim 9 wherein the tapered engagement portion has a convex, curved cross-sectional profile for engagement with ~~a~~ the tapered mouth having a linear cross-sectional profile, the curved cross-sectional profile being substantially arcuately shaped.

12. (Amended) The fitting of claim 9 wherein the tapered engagement portion has a convex, curved cross-sectional profile for engagement with ~~a~~ the tapered mouth having a linear cross-sectional profile, the curved cross-sectional profile being substantially elliptically shaped.

~~13. The fitting of claim 9 wherein the engagement portion has a linear cross-sectional profile for engagement with a tapered mouth having a convex, curved cross-sectional profile.~~

14. (Amended) The fitting of claim 9 wherein the ~~tangential~~ contact angle ~~is~~measures between 50 and 59 degrees from the longitudinal and radial axes~~coupling axis~~.

15. (Amended) The fitting of claim 9 wherein the tangential contact angle ~~is~~ measures approximately 54 degrees from the longitudinal and radial axes~~coupling axis~~.

16. ~~The fitting of claim 9 wherein the engagement portion of the fitting is radially symmetric with respect to the coupling axis.~~

17. (Amended) A vessel formed of a metallic material for containing a fluid at a pressure greater than or equal to 15,000 psi, the vessel being sealed by a fitting of a like metallic material, without requiring an insert therebetween, the fitting having a ~~tapered mouth~~ first tapered engagement portion for engaging the vessel along a coupling axis, the vessel comprising:

a second tapered engagement portion shaped to sealingly contact the tapered mouth in a circular seal, the circular seal having a tangential contact angle measuring between 40 and 68 degrees from the coupling axis.

~~18. The vessel of claim 17 wherein the engagement portion has a convex, curved cross-sectional profile for engagement with a tapered mouth having a linear cross-sectional profile.~~

~~19. The vessel of claim 17 wherein the engagement portion has a convex, curved cross-sectional profile for engagement with a tapered mouth having a linear cross-sectional profile, the curved cross-sectional profile being substantially arcuately shaped.~~

~~20. The vessel of claim 17 wherein the engagement portion has a convex, curved cross-sectional profile for engagement with a tapered mouth having a linear cross-sectional profile, the curved cross-sectional profile being substantially elliptically shaped.~~

21. (Amended) The vessel of claim 17 wherein the second tapered engagement portion has a linear cross-sectional profile for engagement with ~~a~~ the first tapered ~~mouth~~ engagement portion having a convex, curved cross-sectional profile.

22. The vessel of claim 17 wherein the tangential contact angle is between 50 and 59 degrees from the coupling axis.

23. The vessel of claim 17 wherein the tangential contact angle is approximately 54 degrees from the coupling axis.

24. (Amended) The vessel of claim 17 wherein the second tapered engagement portion ~~of the fitting~~ is radially symmetric with respect to the coupling axis.

25. (Amended) A method for forming a fluid-tight seal in an ultrahigh pressure fluid containment system, without the need for a gasket or other insert, the method comprising:

providing a first component with ~~an~~ first tapered engagement portion having a linear cross-sectional profile, the first engagement portion being symmetrical about a longitudinal axis of the first component, the linear cross-sectional profile being angled between 40 and 68 degress from the longitudinal axis;

abutting a second component having ~~an~~ second tapered engagement portion against the first component with the respective tapered engagement portions in contact with each other, the second tapered engagement portion ~~of the second component~~ having a curved cross-sectional profile such that the contacting surface between the components is circular having a tangential contact angle measuring between 40 and 68 degrees from the longitudinal axis; and

urging the first and second components against each other.

26. (New) A method for forming a fluid-tight seal in an ultrahigh pressure fluid containment system, without the need for a gasket or other insert, the method comprising:

providing a first component having a first longitudinal bore and a first tapered engagement portion with a linear cross-sectional profile that is symmetrical about a first longitudinal axis;

providing a second component having a second longitudinal bore and a second tapered engagement portion with a curved cross-sectional profile that is symmetrical about a second longitudinal axis;

abutting the first component against the second component with their longitudinal axes aligned and their tapered engagement portions in contact with each other, such that the contacting surface between the components is circular; and

urging the first and second components against each other.

356878_1.DOC